



GRADE 11 EXEMPLAR PAPERS
NOVEMBER 2007

MATHEMATICS: PAPER III

MARKING GUIDELINES

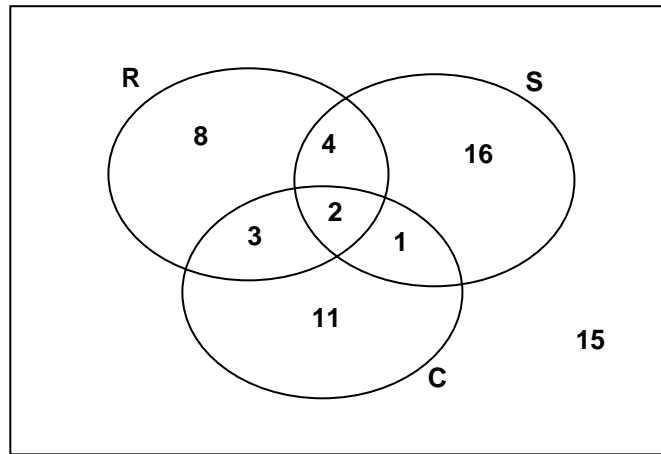
Time: 2 hours

100 marks

Question 1

A sample of 60 people is asked which of 3 sports they watch on TV. The sports are Rugby (R), Soccer (S) and Cricket (C).

The results are shown in the Venn diagram below.



A person is selected at random from the group. Giving all your answers in simplest fraction form, find the probability that a randomly selected person

- (a) watches NONE of the sports $\frac{15}{60} = \frac{1}{4} \checkmark^a$ (1)
- (b) watches soccer $\frac{23}{60} \checkmark^a$ (1)
- (c) watches rugby AND soccer $\frac{6}{60} = \frac{1}{10} \checkmark^a$ (1)
- (d) watches cricket OR soccer $\frac{37}{60} \checkmark^a$ (1)
- (e) does not watch cricket $\frac{43}{60} \checkmark^a$ (1)
- (f) watches rugby but does not watch cricket $\frac{12}{60} = \frac{1}{5} \checkmark^m \checkmark^a$ (2)
- (g) watches neither rugby NOR cricket $\frac{31}{60} \checkmark^m \checkmark^a$ (2)

DEDUCT 1 MARK OVERALL FOR NOT SIMPLIFYING FRACTIONS

9 marks

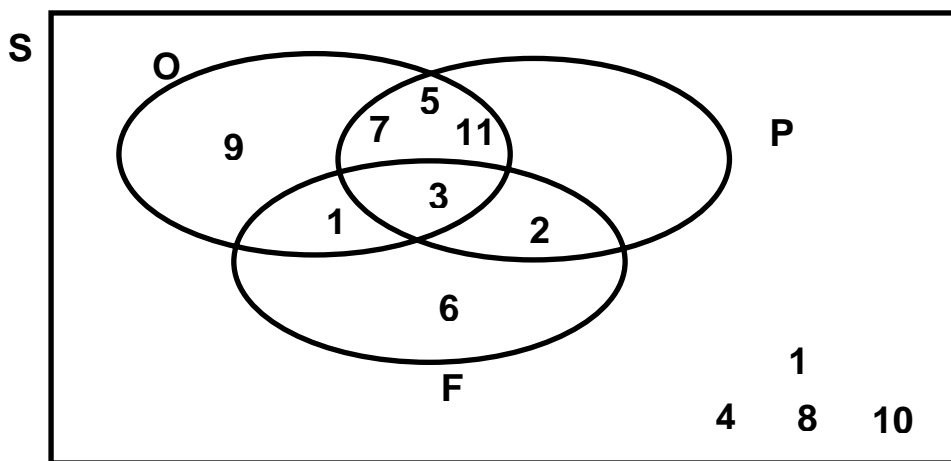
Question 2

S is the sample space of Natural numbers LESS THAN 13. One number is drawn randomly from **S**.

O is the event "the number is odd". **P** is the event "the number is prime".

F is the event "the number is a factor of 6".

Represent this information in a Venn diagram.



3 overlapping sets ✓^m
 intersection elements correct ✓^m
 non-intersecting elements correct ✓^m
 elements outside 3 sets correct ✓^m

4 marks

Question 3

236 students were asked what type of cell-phone they used. The results are shown in the table.

Type of cellphone	Boys	Girls	Total
Brand A	48	52	100
Brand B	40	34	74
Brand C	32	30	62
Total	120	116	236

- (a) Are the events "Boy" and "Brand A cell-phone" mutually exclusive? Justify your answer. (2)

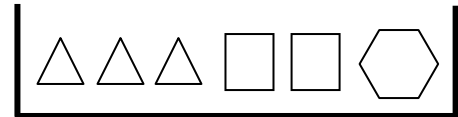
✓^a No – "boy" AND "Brand A" = 48 (i.e. not empty) ✓^a

- (b) Prove that the events "Boy" and "Brand A cell-phone" are **dependent**. (4)

6 marks

Question 4

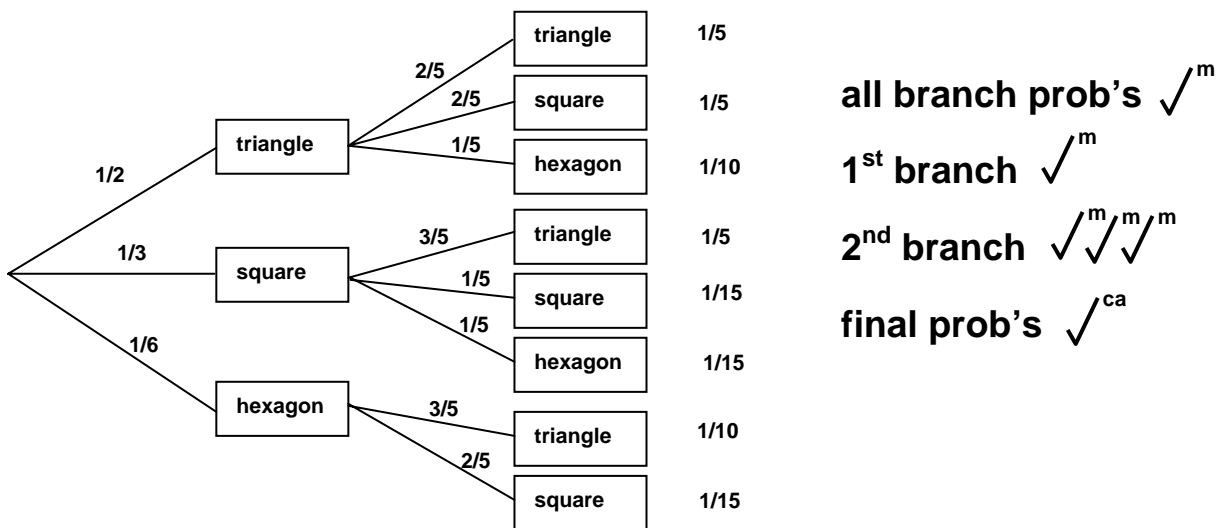
A box contains 3 triangles, 2 squares and 1 hexagon.



Each of the 6 objects has an equal chance of being selected at random from the box.

An object is selected at random, **NOT REPLACED**, and then a second object is selected at random.

- (a) Represent this selection process in a tree diagram, clearly indicating all probabilities in simplest fraction form. (6)



- (b) Use your probability tree (or otherwise) to calculate the probabilities of the following (in simplest fraction form):

(1) of drawing a hexagon and then a triangle $\frac{1}{10} \sqrt{^{ca}}$ (1)

(2) of drawing two identical shapes $\frac{1}{5} + \frac{1}{15} \sqrt{^m} = \frac{4}{15} \sqrt{^{ca}}$ (2)

9 marks

Question 5

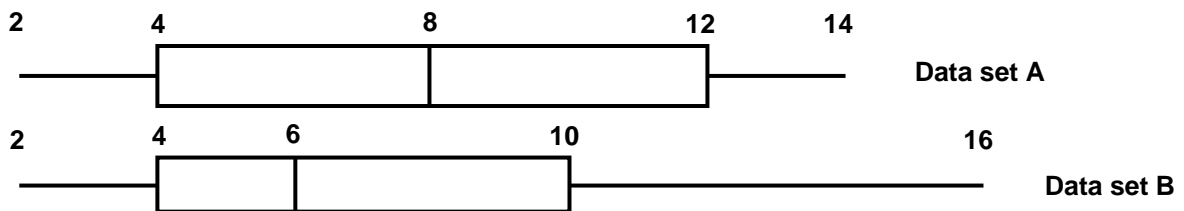
State whether the following statements are true (T) or false (F):

- (a) If the mean is greater than the median, the data tend to be positively skewed
- (b) The median is NOT influenced by outliers.
- (c) The 50th percentile is also called the mean.
- (d) If the data are negatively skewed, most of the data lie to the left of the median.

T	✓ ^a	(1)
T	✓ ^a	(1)
F	✓ ^a	(1)
F	✓ ^a	(1)

4 marks

Question 6



The box-whiskers diagrams of two sets of data – A and B – are shown above.

The extreme values of Set A are 14 and 2, and in B 16 and 2. They both have the same lower quartile.

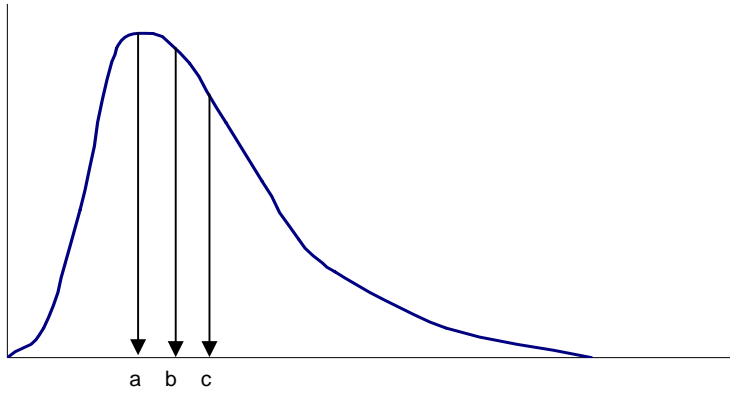
- (a) Which data set is the most symmetrical?
- (b) Which data set has the larger interquartile range?
- (c) Is data set B skewed left (L) or right (R)?
- (d) Which data set has the larger standard deviation? Explain your answer.

A	✓ ^a	(1)
A	✓ ^a	(1)
R	✓ ^a	(1)
A	✓ ^a	(1)

✓^m ✓^m
the IQR of set A is larger hence, the sd is larger

6 marks

Question 7



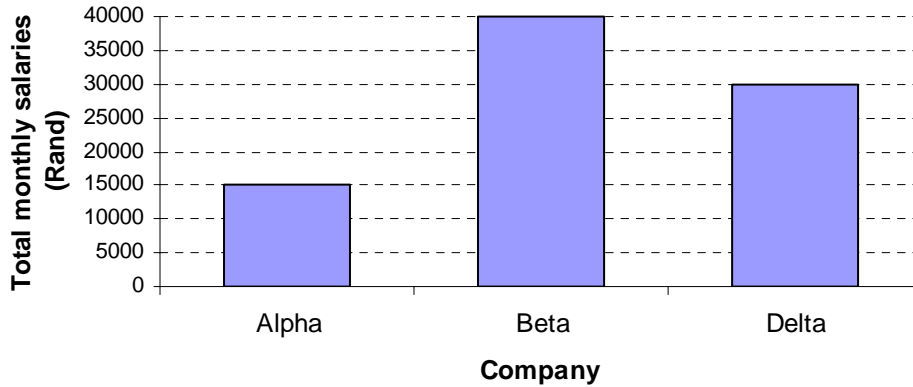
Match each of the values a, b and c with one of the following measures of central tendency

- mean c \sqrt{a}
- median b \sqrt{a}
- mode a $\sqrt{a(3)}$

3 marks

Question 8

Total monthly salaries paid by 3 companies



The **total** amount of money that 3 companies pay each month to their employees is shown in the bar chart.

- (a) Is the information in the diagram sufficient to indicate which company tends to pay its employees more? Justify your answer. (2)

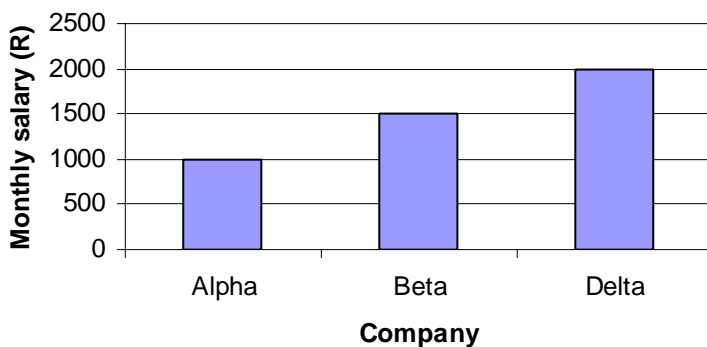
\checkmark^a \checkmark^m
No; number of employees not mentioned

- (b) Alpha Company has 10 employees, Beta Company has 40 employees and Delta company has 15 employees. At which company is the average monthly salary the highest? (2)

\checkmark^m \checkmark^a
Some form of calculation and the decide C best

- (c) Represent the data more accurately. (4)

Average monthly salary at 3 companies



headings & scale \checkmark^m

shows averages \checkmark^m

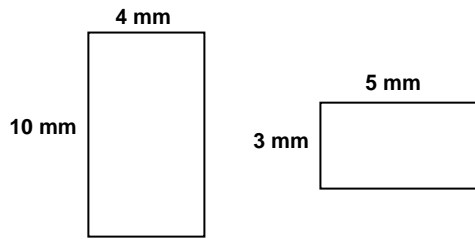
correct bar chart \checkmark^m
 \checkmark^a

8 marks

Question 9

- (a) Two rectangles are shown. Explain whether the rectangles are similar OR not, giving a reason for your answer.

(2)



not similar; sides not in proportion

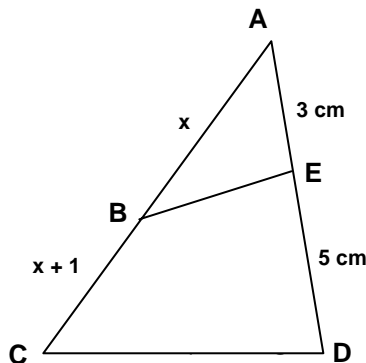
- (b) "Two right-angled triangles both have a hypotenuse 10 cm long, thus they are similar." Is this statement True? Give a reason for your answer.

(2)

False ; any reasonable example or explanation

- (c) In the diagram, which is not drawn to scale, is it possible for BE to be parallel to CD? Explain your answer.

(3)

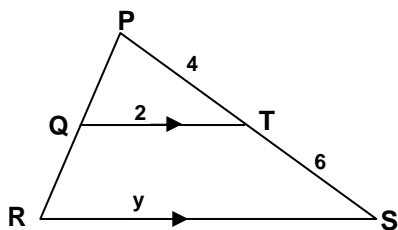


For BE to be parallel to CD, require

$$\text{hence need } 5x = 3x + 3 \text{ ie } x = \frac{3}{2}$$

- (d) Find the value of y.
[Hint: write down, without reason, 2 similar triangles.]

(3)



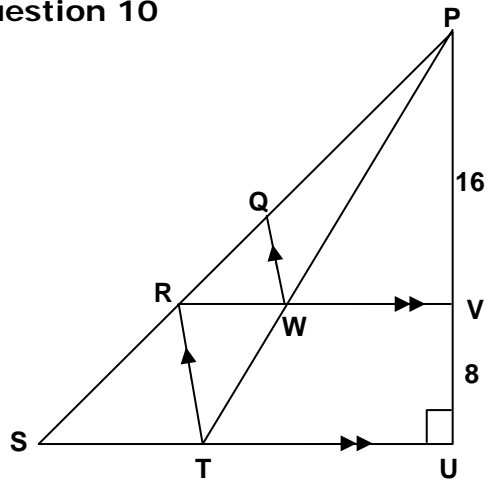
$$\Delta PQT \parallel \Delta PRS$$

$$\frac{4}{10} = \frac{2}{y}$$

$$y = 5$$

10 marks

Question 10



In the figure, $RV \parallel STU$ and $QW \parallel RT$.

$PV = 16$ mm and $UV = 8$ mm. $\hat{U} = 90^\circ$.

(a) Write down the value of the following, **without reasons**

(1) $\frac{PW}{WT} = 2$ or $\frac{2}{1} \sqrt{^a}$ (1)

(2) $\frac{RV}{SU} = \frac{2}{3} \sqrt{^a}$ (1)

(3) $\frac{PR}{RS} = \frac{2}{1} \sqrt{^a}$ (1)

(4) $\frac{PQ}{QS} = \frac{4\sqrt{^a}}{5\sqrt{^a}}$ (2)

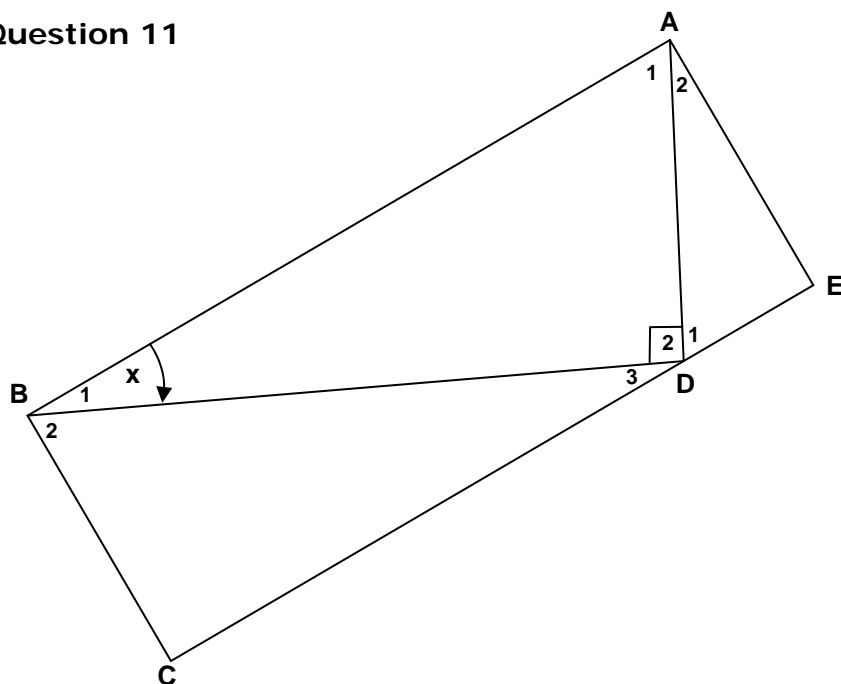
(b) Name a triangle that is

(1) similar to $\triangle PWV$ $\triangle PTU$ \checkmark correct letters \checkmark correct order (2)

(2) similar to $\triangle QRW$ $\triangle RST$ \checkmark correct letters \checkmark correct order (2)

9 marks

Question 11



ABCE is a **rectangle**.

$\hat{A}DB = 90^\circ$ $\hat{A}BD = x$

$\hat{A}BD = x$

(a) Find, **giving reasons**, the size of each of the following angles **in terms of x**.

(1) $\hat{B}DC$ x \sqrt{a} **alt angles** \sqrt{ca} (2)

(2) $\hat{A}DE$ $90 - x$ \sqrt{a} **angles on a line** \sqrt{ca} (2)

(b) Prove that

(1) $\triangle ADB \parallel \triangle DEA$ (3)

$\hat{B}DA = 90^\circ$ **given** $\hat{E} = 90^\circ$ **angle in a rectangle** \sqrt{m}

$\hat{A}BD = x$ **given** $\hat{D}AE = x$ **angles in a \triangle** \sqrt{ca}

$\triangle ADB \parallel \triangle DEA$ **equiangular** \sqrt{a}

(2) and hence that $AD^2 = AB \cdot DE$ (1)

$\therefore \frac{AD}{DE} = \frac{AB}{AD} = \frac{BD}{AE}$ **sides in proportion in similar \triangle 's** \sqrt{m}
and cross-multiply

(c) If it is further **GIVEN** that $\triangle ADB \parallel \triangle BCD$ (**you do not have to prove this**) write down an expression for BD^2 . (1)

$BD^2 = AB \cdot CD$ \sqrt{a}

(d) If $\frac{CD}{DE} = \frac{9}{1}$ find the value of $\frac{BD}{AD}$. [Hint: use your expressions]

from (b) and (c).]

(3)

$$\frac{AD^2}{BD^2} = \frac{AB \cdot DE}{AB \cdot CD} \quad \checkmark^m$$

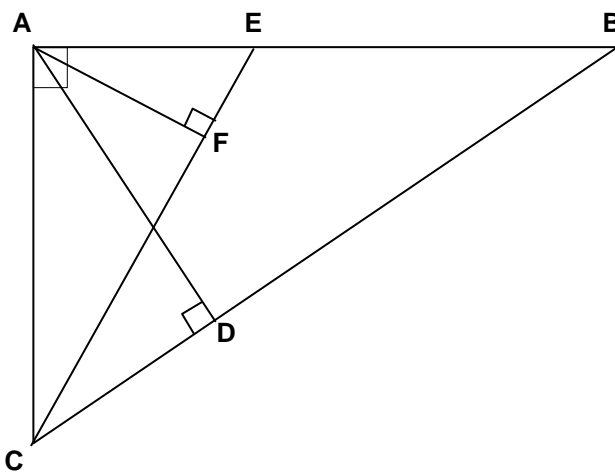
$$\frac{AD^2}{BD^2} = \frac{DE}{CD} = \frac{1}{9} \quad \checkmark^{ca}$$

$$\Rightarrow BD : AD = 3 : 1$$

\checkmark^{ca}

12 marks

Question 12



$$\hat{BAC} = 90^\circ$$

$$\hat{AFE} = 90^\circ$$

$$\hat{ADC} = 90^\circ$$

(a) Prove that $\frac{CD}{CE} = \frac{CF}{CB}$

(5)

in right-angled $\triangle ABC$ $AC^2 = CD \cdot BC$ $\checkmark^m \checkmark^a$

in right-angled $\triangle ACE$ $AC^2 = CF \cdot CE$ $\checkmark^m \checkmark^a$

$$\therefore CD \cdot BC = CF \cdot CE \quad \Rightarrow \quad \frac{CD}{CE} = \frac{CF}{BC} \quad \checkmark^{ca}$$

(b) If $CF = 8$ cm, $CE = 10$ cm and $CD = 4$ cm, find the length of

(1) DB

(3)

$$\frac{CD}{CE} = \frac{CF}{BC} \quad \therefore \frac{4}{10} = \frac{8}{BC} \quad \therefore BC = 20 \text{ cm}$$

$$DB = BC - CD = 20 - 4 = 16 \text{ cm}$$

(2) AB (to 1 decimal place)

(3)

$$\text{from (a) } AC^2 = CD \cdot BC \quad \therefore AC^2 = (4)(20) = 80 \quad \therefore AC = \sqrt{80}$$

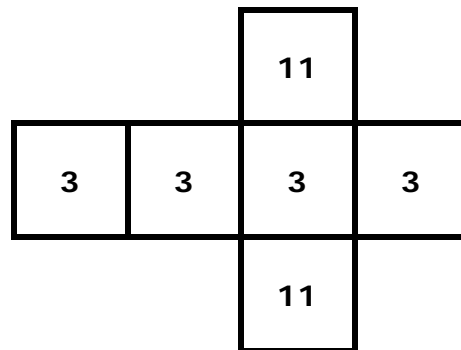
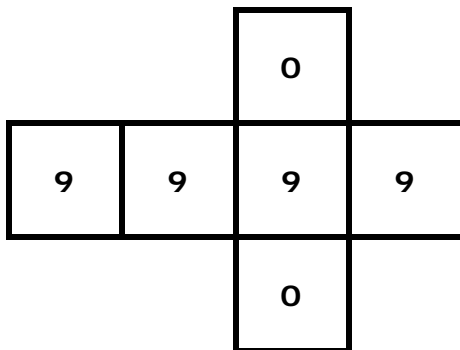
$$\text{Using Pythagoras in } \triangle ABC, AB = \sqrt{20^2 - \sqrt{80}^2} = 17,89 \text{ cm}$$

11 marks

Question 13

The nets of 2 fair dice are shown below.

DIE A
DIE B



Two players are going to play a game with the dice. The 1st player selects a die and rolls it once. The 2nd player rolls the other die once. The winner is the player with the highest score.

- (a) Suppose you are the 1st player. Which die would you select in order to maximize your chance of winning? Clearly justify your answer.

(6)

		Die A					
		0	0	9	9	9	9
Die B	3	B	B	A	A	A	A
	3	B	B	A	A	A	A
	3	B	B	A	A	A	A
	3	B	B	A	A	A	A
	11	B	B	B	B	B	B
	11	B	B	B	B	B	B

\sqrt{m}
 \sqrt{m}
 \sqrt{a}

$$P(A \text{ wins}) = \frac{16}{36} = \frac{4}{9} \quad P(B \text{ wins}) = \frac{20}{36} = \frac{5}{9} \quad \text{select B}$$

- (b) Suppose the player using Die A wins R45 each time he/she wins a game. How much should the player using Die B receive when he/she wins if the game must be **fair**. A "fair game" is a game in which both players end up with the same winnings after a large number of games.

(3)

if they play 36 times, A will win $16 \times 45 = 720$ \therefore B must win $\frac{720}{20}$
i.e. R 36

9 marks

[Total: 150 marks]